

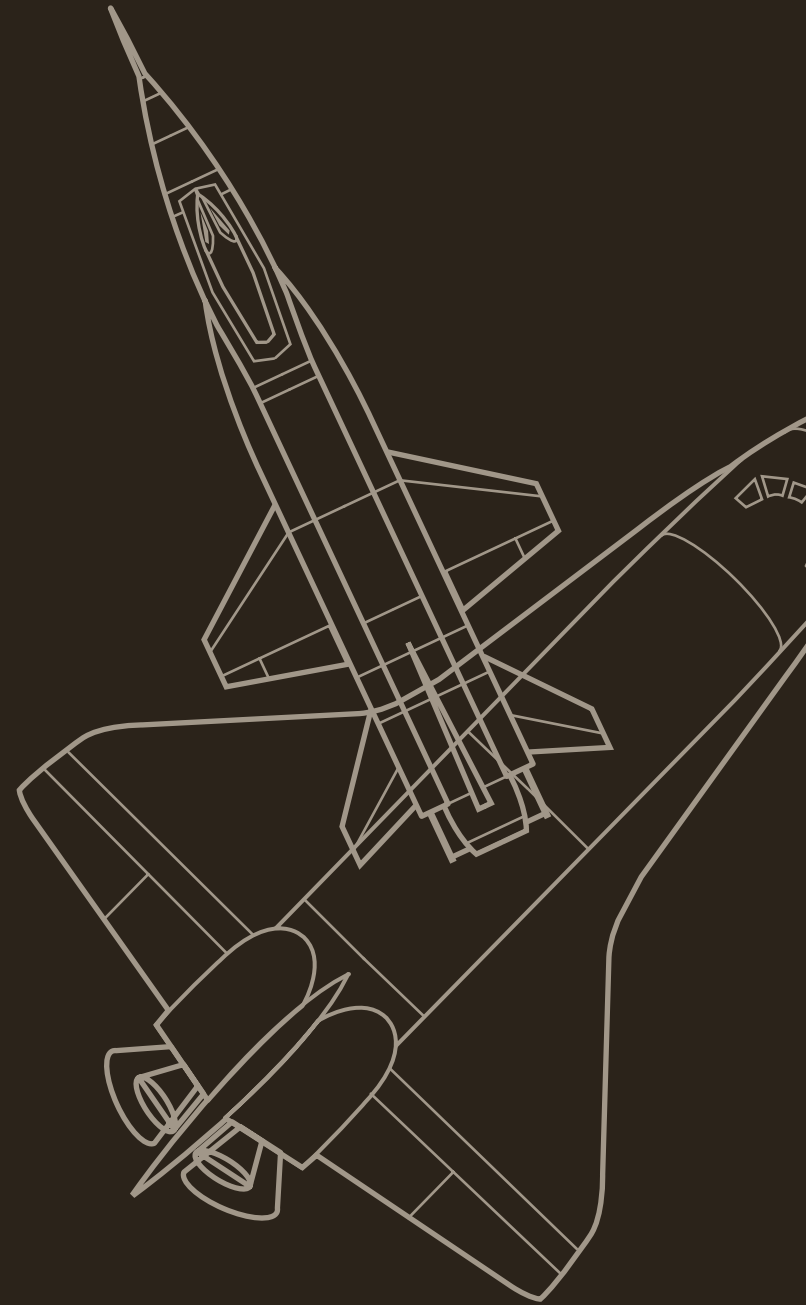
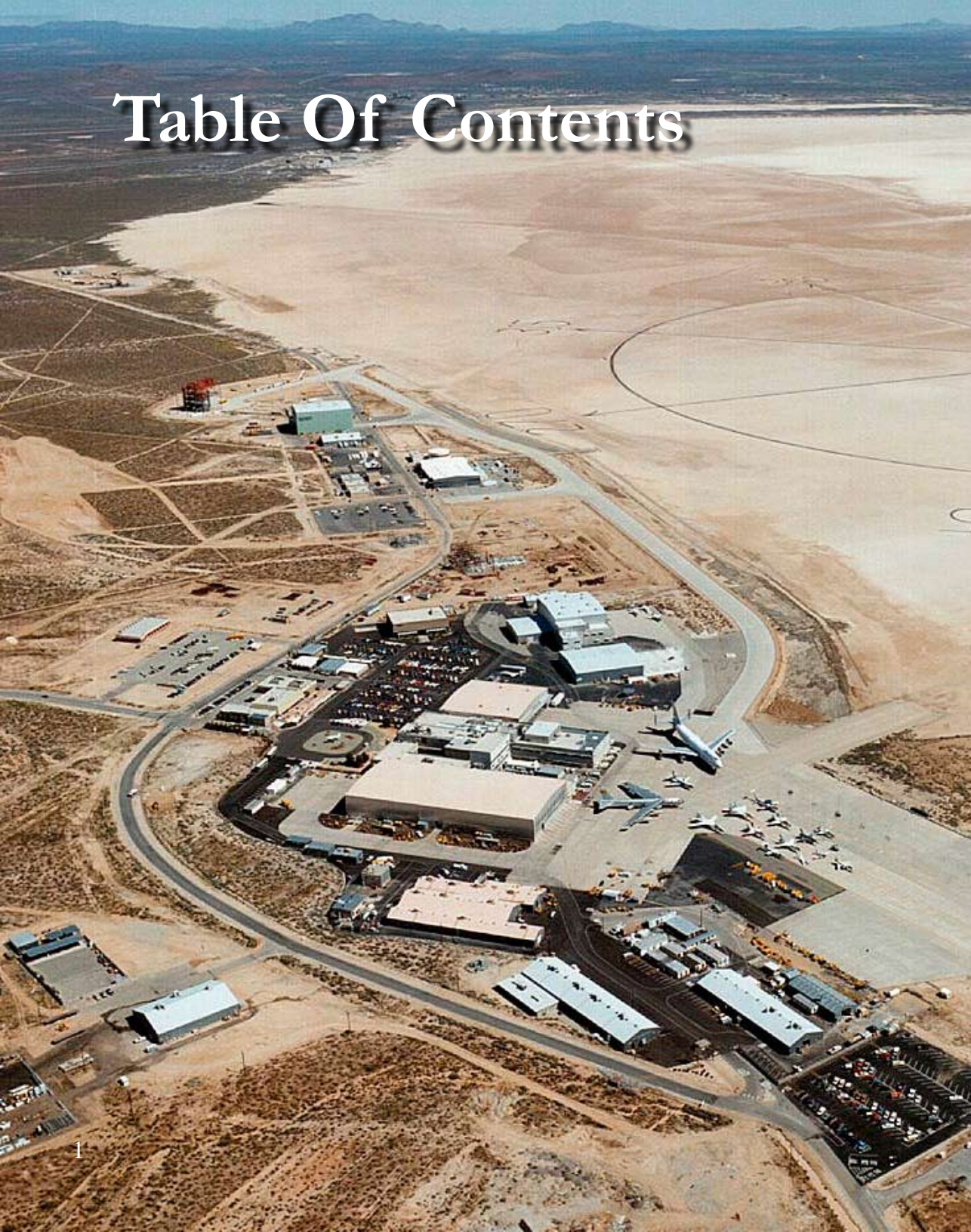
National Aeronautics and Space Administration




X-1E

Dryden

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NASA's Dryden Flight Research Center is located at Edwards Air Force Base, which, for over 60 years, has been the setting for the exciting and often hazardous job of testing the world's most exotic aircraft. The essential role of flight research continues as part of Dryden's strategic intent – to remain recognized as the premier flight research and test organization for the validation of high-risk, pioneering aerospace technology, space exploration concepts, and the conduct of science mission observations.

Dryden's project teams have successfully accomplished many of the nation's most complex flight research projects. The information here demonstrates how the Center has created and refined innovative flight research techniques that encompass all phases of flight projects, from highly developed design through development, fabrication, and operations processes. Through this ongoing refinement Dryden continues to expand its world-class capabilities, which include an expert work force, natural infrastructure, unique facilities and aircraft, flexible project management, and a proven operating system.

Perhaps James Webb, NASA's second administrator, said it best, "Flight testing of new concepts, designs, and systems is fundamental...Laboratory data alone, and theories based on these data, cannot give all the answers....Each time a new aircraft flies, a 'moment of truth' arrives for the designer as he discovers whether a group of individually satisfactory elements add together to make a satisfactory whole, or whether their unexpected interactions result in a major deficiency. Flight research plays the essential role in assuring that all the elements of an aircraft can be integrated into a satisfactory system."

From validating highly modified aircraft to space exploration concepts – and all phases in between – Dryden remains uniquely qualified to serve in the roles of revolutionizing aviation and pioneering aerospace technologies.

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Advancing Technology and Science Through Flight

Dryden's Mission:

- Perform flight research and technology integration to revolutionize aviation and pioneer aerospace technology
- Validate space exploration concepts
- Conduct airborne remote sensing and science missions
- Support operations of the Space Shuttle and the International Space Station

...for NASA and the nation

To Fly What Others Only Imagine





Dryden's role in Space Exploration:

Dryden's expertise in atmospheric flight research and test provides significant progress toward the fulfillment of US space exploration. NASA's Orion Crew Exploration Vehicle (CEV), part of the Constellation Program to send human explorers back to the moon, will use a Launch Abort System (LAS) designed to propel the Crew Module (CM) and its crew safely from a launch pad or in-flight emergency. As part of the Orion Abort Flight Test Project, Dryden's team will flight test the prototype and production LAS, CM, and Service Module (SM) separation elements for safe abort characteristics and verify that the system meets performance requirements during a stationary pad-abort and various ascent-abort scenarios under boost. The heritage of the Mercury and Apollo programs, in which similar systems were used, combined with CEV design validation requirements, will be used to define LAS testing requirements for the Orion project.



The Dryden Flight Research Center has the following responsibilities:

- Instrumentation of the abort flight test systems
- Integration and test of flight controls systems and parachutes
- Mobile launch control room
- Preflight ground testing
- Launch facility construction
- Ground safety and quality control
- Independent simulation analysis

Flight Research, Test, and Development Engineering Capabilities

Aerodynamics and Propulsion

- Fluid mechanics and flight mechanics
- Atmospheric aerodynamics
- Airdata measurement
- Propulsion research and technologies
- Meteorological support

Aerostructures

- Thermal/structural ground test, analysis, and flight research
- Flight envelope expansion (static loads and flutter)
- Internal and external loads (static, dynamic, and thermal)
- Development of advanced sensor technology for flight and ground test, including structural health monitoring
- Applied to ultra-lightweight aircraft through hypersonic vehicles

Dynamics and Controls

- Flight controls, navigation, and guidance
- Flight dynamics
- Flying qualities/handling qualities
- Flight research data analysis
- Intelligent/adaptive/robust flight control
- Multi-vehicle control
- Autonomous/adaptive mission
- Precision trajectories





Flight Instrumentation

- Design, develop, and implement instrumentation for high-fidelity flight research quality data
- Custom solutions for unique requirements using rapid prototype design, fabrication, and test support
- Selection, design, fabrication, qualification, integration, and installation
- Calibration of flight measurement systems
- Instrumentation research and development in measurement methods, sensors, analysis techniques, data transmission, and processing

Flight Systems

- Flight systems development
- Flight software management/development
- Systems engineering, integration, and test

Facilities

Dryden uses a **system of facilities**, consisting of experimental labs and shops for modification, repair, instrumentation, test, and qualification, to support its mission. Each facility brings a unique and needed capability to the system and while each is considered a national asset, combining these assets offers capabilities and efficiencies not possible with stand-alone facilities. Because facility elements are designed and managed as an integrated system and results from one facility often feed analysis in another, the result is greater than the sum of the parts. Combining these facility assets with access to the Edwards Air Force Base and vast western ranges, 350 test flight days per year, and world-class technical expertise makes Dryden the premier flight research and test organization for the validation of high-risk, pioneering aerospace technology, space exploration concepts, and the conduct of science mission observations.

Western Aeronautical Test Range (WATR)

The WATR is a network of facilities used to support aerospace flight research and technology integration, space exploration concepts, airborne remote sensing and science missions, and operations of the Space Shuttle and International Space Station. These facilities consist of telemetry tracking systems, space positioning systems, audio communication systems, video systems, mission control centers, and mobile systems.



Research Aircraft Integration Facility (RAIF)

The RAIF provides high-fidelity real-time and batch flight simulation capabilities, closed-loop hardware-in-the-loop and vehicle-in-the-loop verification and validation testing, ground vibration testing, and routine aircraft maintenance. This facility can simultaneously support a variety of advanced, highly integrated research aircraft, including a mix of commercial, military, and unmanned vehicles of various sizes. The co-location of project and facility management, vehicle maintenance, and engineering personnel allows the RAIF to support advanced aeronautical and space-based research throughout all phases of the research program within a single facility.

Structural Fabrication and Repair Facility

This facility consists of four shops: the Machine Shop, the Sheet Metal Shop, the Welding Shop, and the Fluid System Lab. A composite room was recently added for the structural repair of composite aircraft. Dryden is also part of NASA's Fabrication Alliance, in which all ten NASA Centers consolidate expertise and share jobs requiring sophisticated work, allowing more complex projects to be built simultaneously. Although aluminum is most commonly used, the shop also works with titanium, carbon steel, stainless steel, carbon fiber, fiberglass, and plastics.

Flight Loads Laboratory (FLL)

The Flight Loads Laboratory offers thermal, structural, ground vibration, and structural mode interaction testing of aircraft and aircraft structural components. The ability to do all of these tests under one roof is convenient and efficient for customers.

To carry out these tests, the FLL has a large data acquisition and thermal control system, 84 channels of hydraulic load control, and systems for applying advanced instrumentation. The FLL also uses a unique virtual laboratory system for

remote, real-time monitoring of tests through a secure Internet connection. In addition, the FLL is home to an experienced workforce of engineers and technicians. State-of-the-art tools are used to design and analyze test setups needed for testing one-of-a-kind items.



A U.S. Navy E-2C Hawkeye aircraft undergoing loads calibration testing in the Flight Loads Laboratory. Tests included the study of engine loading effects on the wing load measurements.

The DC-8 Airborne Laboratory, left, and the Stratospheric Observatory for Infrared Astronomy (SOFIA) are two of the science platforms housed at the Dryden Aircraft Operations Facility.



Dryden Aircraft Operations Facility

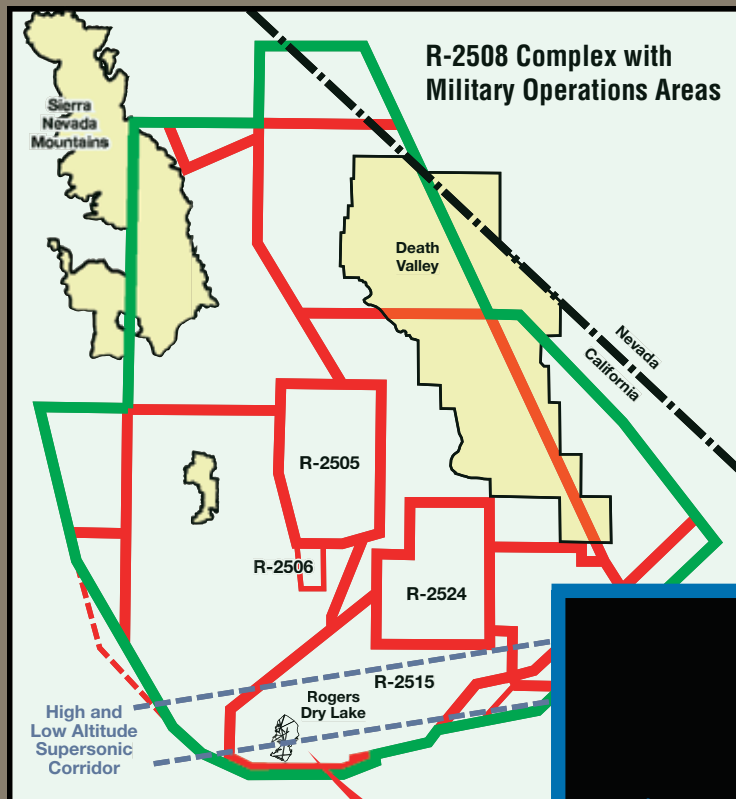
The Dryden Aircraft Operations Facility is about 35 miles southwest of Dryden and has direct access to the U.S. Air Force Production Flight Test Installation (Plant 42) and its two 12,000-foot runways. With over 210,000 square feet of hangar space and an equivalent amount of space for offices, labs, conference accommodations, and storage, the facility is ideal for collaboration among private industry, visiting scientists and researchers, and aviation-related activity. In addition, the facility is within short driving distance to airports in Burbank, Los Angeles, Ontario, and Palmdale.

The Dryden Aircraft Operations Facility's location places it at the cornerstone of the aerospace research, development, and flight test complex in Southern California's high desert. In addition to being near major plants operated by The Boeing Company, Lockheed

Martin, and Northrop Grumman at or adjacent to Plant 42, Dryden's facility is only a short distance from Edwards Air Force Base; the Mojave Air and Spaceport; the Naval Air Warfare Center at China Lake; General Atomics Aeronautical Systems' assembly and checkout facilities at Adelanto, El Mirage, and Grey Butte; and the Southern California Logistics Airport near Victorville, all of which combine to create a busy hub of aerospace activity.

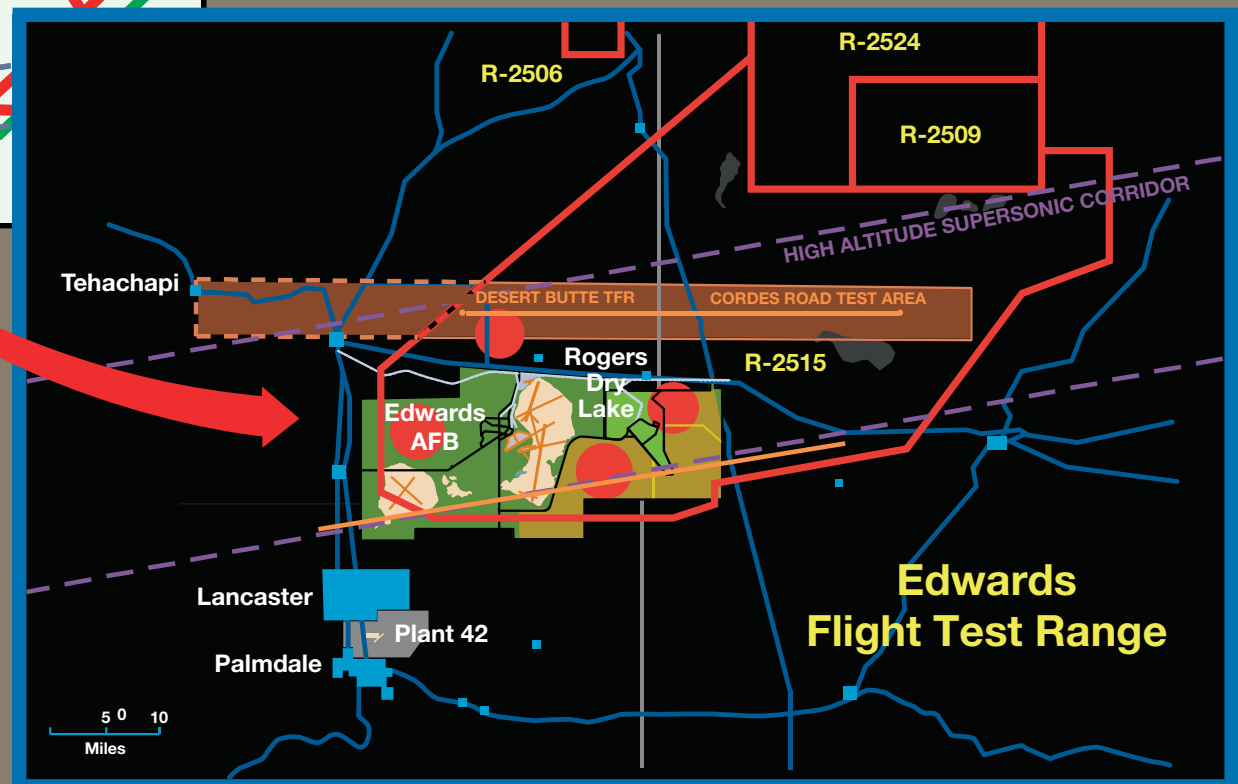
Aircraft operating from Dryden's Palmdale facility have access to the runways and dry lakebeds at Edwards, the restricted airspace of the R-2508 and adjacent test ranges, and the largest overland supersonic flight test corridor in the country.

Resources



- Proximity to aerospace hub of activity
 - China Lake, Grey Butte, Los Angeles, Mojave, Nellis, Palmdale, Point Mugu, Vandenberg
- R-2508 restricted airspace complex
- AFFTC/Dryden/AFRL Alliance
- Sparse population
- Southwest Range Complex
 - Arizona, Nevada, New Mexico, Pacific Ocean, Utah

- Access to Edwards Air Force Base facilities
- Aerial refueling
- AFFTC/Dryden Alliance
- Central computing facility
- NASA Fabrication Alliance
- Only overland supersonic corridors in the U.S.
- Paved surface and hard-clay lakebed runways
 - 68 miles combined length





Dryden Flight Research Center provides custom solutions in the operation, maintenance, and modification of one-of-a-kind national assets, as seen in the specially modified CV-990 (a facility designed to test the space shuttle landing gear; lower left) and the Stratospheric Observatory for Infrared Astronomy (SOFIA) aircraft – a 747 modified to carry an 18-ton infrared telescope.

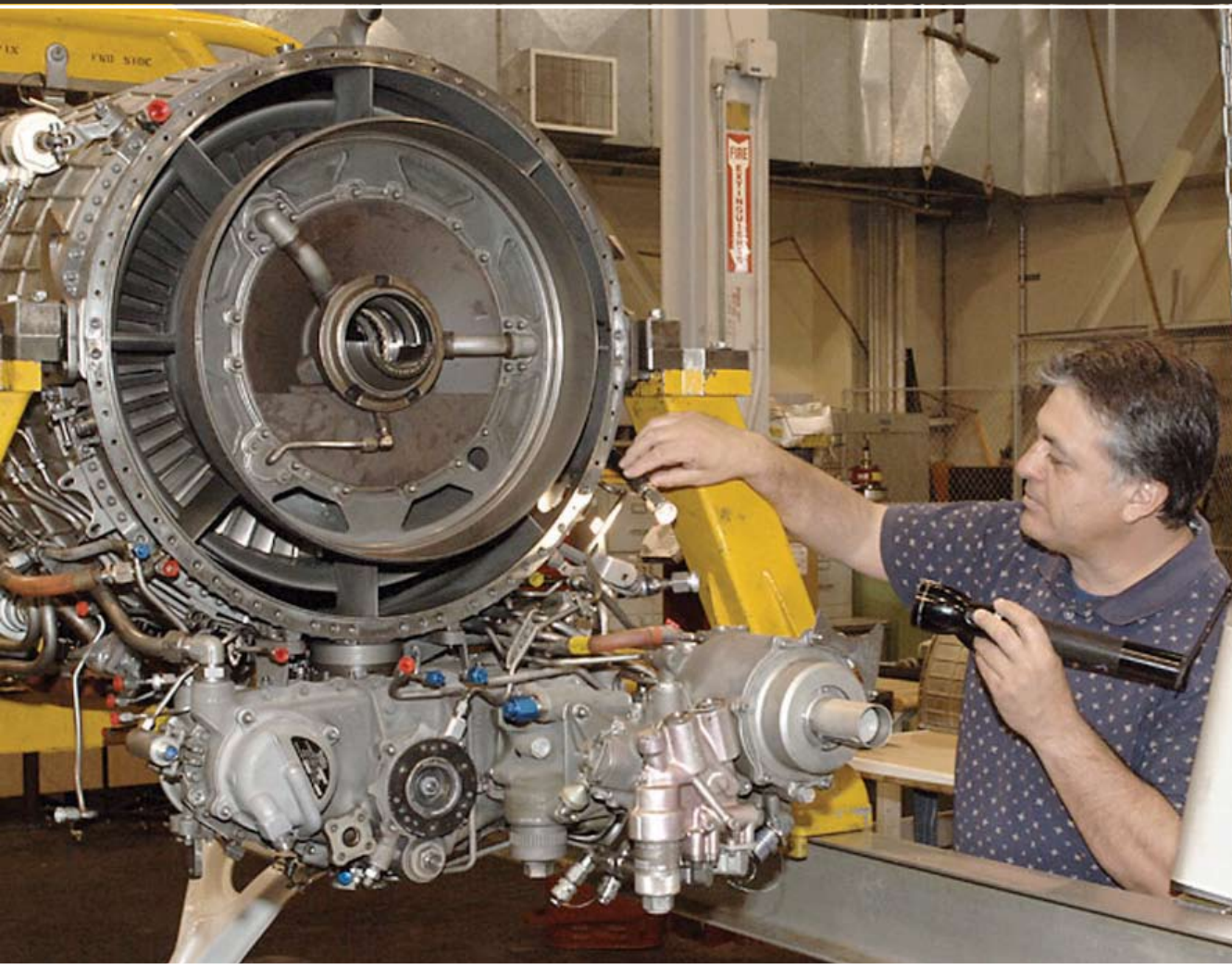


Assets

- Aircraft platforms
 - Research and testbed
 - Science
 - Support
 - Unmanned
- Nine large, multi-purpose hangars
 - ~ 225,000 ft² combined floor space at Dryden
 - ~ 210,000 ft² at the Dryden Aircraft Operations Facility
- Ramp space
 - ~ 385,000 ft² combined ramp space at Dryden
 - ~ 114,000 ft² at the Dryden Aircraft Operations Facility
- Unmanned Aerial System Services
 - Full-service opportunity for small unmanned aircraft system customers requiring test range access, technical expertise, and test resources
 - Streamlined flight-test approval process
- Year-round flying weather



Employee Skill Sets



Flight Operations

- Aircraft maintenance and modification
- Avionics
- Research test pilots
- Unmanned Aerial System (UAS) operations and ground pilots
- Airborne science aircraft
- Experimental aircraft
- Research aircraft
- Flight operations
- Heavy aircraft operations
- High-performance aircraft operations
- Safety chase
- Photo/video chase
- Instrumentation fabrication
 - Calibration
 - Fabrication
 - Telemetry
- Life support
- Quality assurance
- Safety and mission assurance
 - Range safety
 - System safety
- Vehicle configuration management
- Vehicle flight activities
- Vehicle system integration and functional test
- Vehicle technical management

Engineering

- Aerospace
- Civil
- Electrical
- Flight Test
- Instrumentation
- Mechanical
- Operations
- Simulation
- Systems

Support Structure

- Business Development
- Education
- External Affairs and Government Liaison
- Information Technology Security
- Innovative Partnerships Program
- Legal
- Photography
- Public Affairs
- Security
- Technical Publications
- Video Support

Program/Project Management

Science Mission Management

Test Systems

- Advanced test technologies
- Flight Loads Lab systems operation
- Radio frequency management
- Range systems engineering
 - planning, design, development, and implementation
- Range systems operations
 - operation, maintenance, and buildup
- Simulation systems engineering
- Simulation systems operations



Partners and Affiliates



AEROInstitute
AEROSPACE | EDUCATION | RESEARCH | OPERATIONS



U.S. AIR FORCE
Plant42

Summary

Partnership with Dryden provides access to a world-class workforce and flight environment plus unrivaled research facilities. Dryden's Business Development Office is a gateway to an unmatched environment for experimental flight test, and as part of the partnership, we offer extensive experience, expertise, and facilities not available elsewhere:

- Access to restricted airspace (R-2508, the largest overland supersonic corridor in the country) and the premier Edwards AFB range
- Relationships with other NASA Centers and government labs
- Alliance with the Air Force Flight Test Center
- Proximity to aerospace contractors, production, and R&D, the only place like it
- Access to Plant 42
- World-wide operations of our airborne science aircraft
- Ability to conduct test programs on other ranges
- 350+ test days per year
- On-site, tailored safety clearance
- Experimental labs/shops for mod, repair, instrumentation, test, and qualification
- Deep experience in one-of-a-kind flight projects
- Partnership with the AERO Institute
 - Facilitates joint NASA, university, and industry projects; leverages assets

Dryden's Business Development Managers Can Help ...

- Introduce you to the Center and arrange tours of our test facilities
- Find the skill sets to meet your needs
- Work with your staff to develop a Statement of Work
- Facilitate the negotiation of a contract to secure your access to NASA equipment, facilities, and capabilities

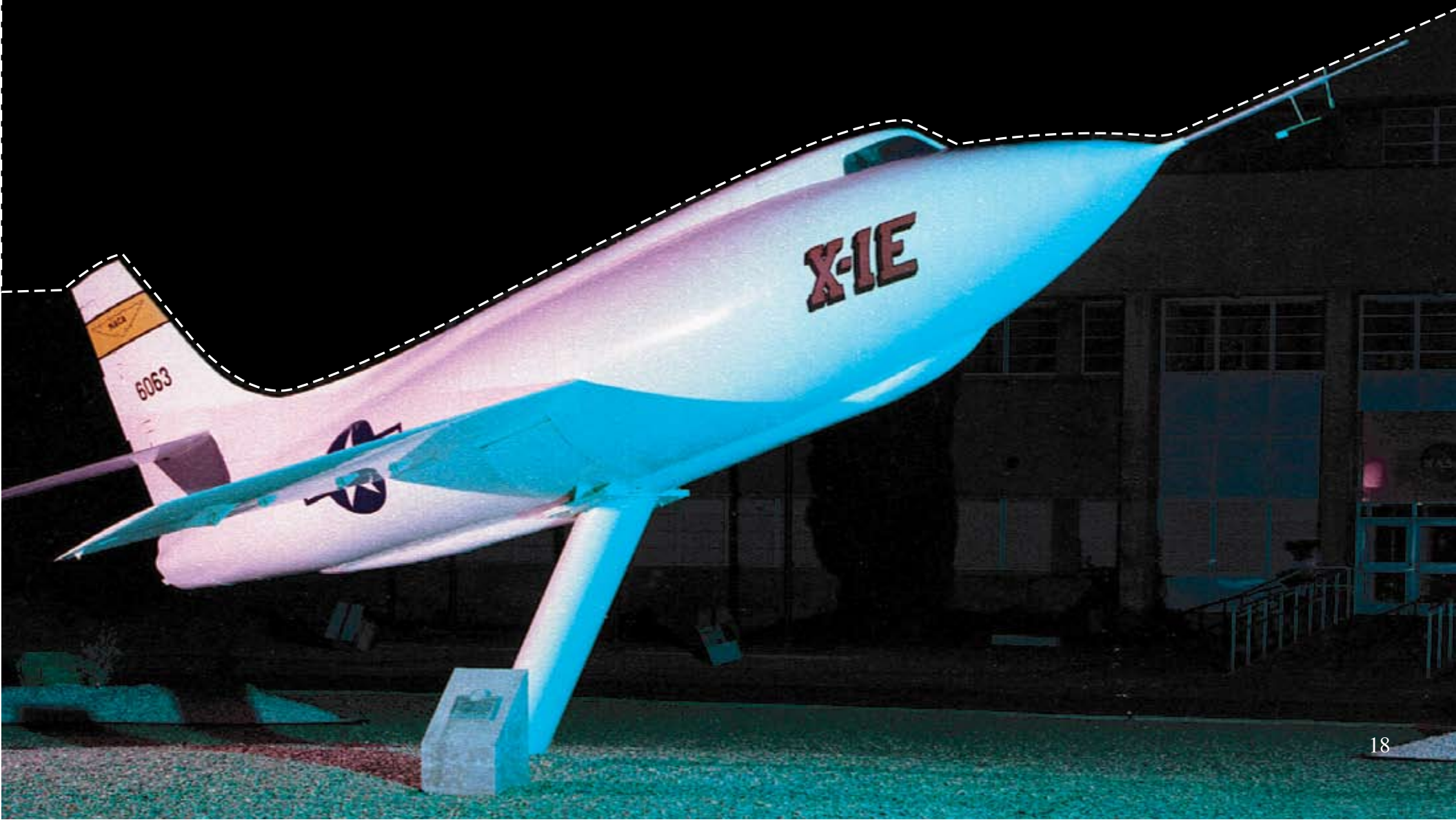
As a partner, Dryden has an unparalleled history in performance, safety, and technical capability. Our proven track record in performance means customers and partners will find a rapid ramp-up to meet their needs; experienced project managers for cost and schedule; and technical expertise to solve problems on site. Safety has always been a part of Dryden's culture and partners know us to have proven and effective safety assurance processes; tailored processes for each project; and on-site, safety clearance authority. Our well-known technical capability allows us to share expertise and experience in aerospace disciplines; expertise and facilities to support simple-to-complex tests; and extensive experience in manned and unmanned systems.

We are proven project managers with an extensive knowledge of Dryden, NASA, and industry capabilities. It's our job to ensure you – our partners and customers – get what you need – from the introductory welcome, through the navigation of our processes, to the exit strategy and handshake – to support your test requirements.





DIE-CUT POCKET





National Aeronautics and Space Administration

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